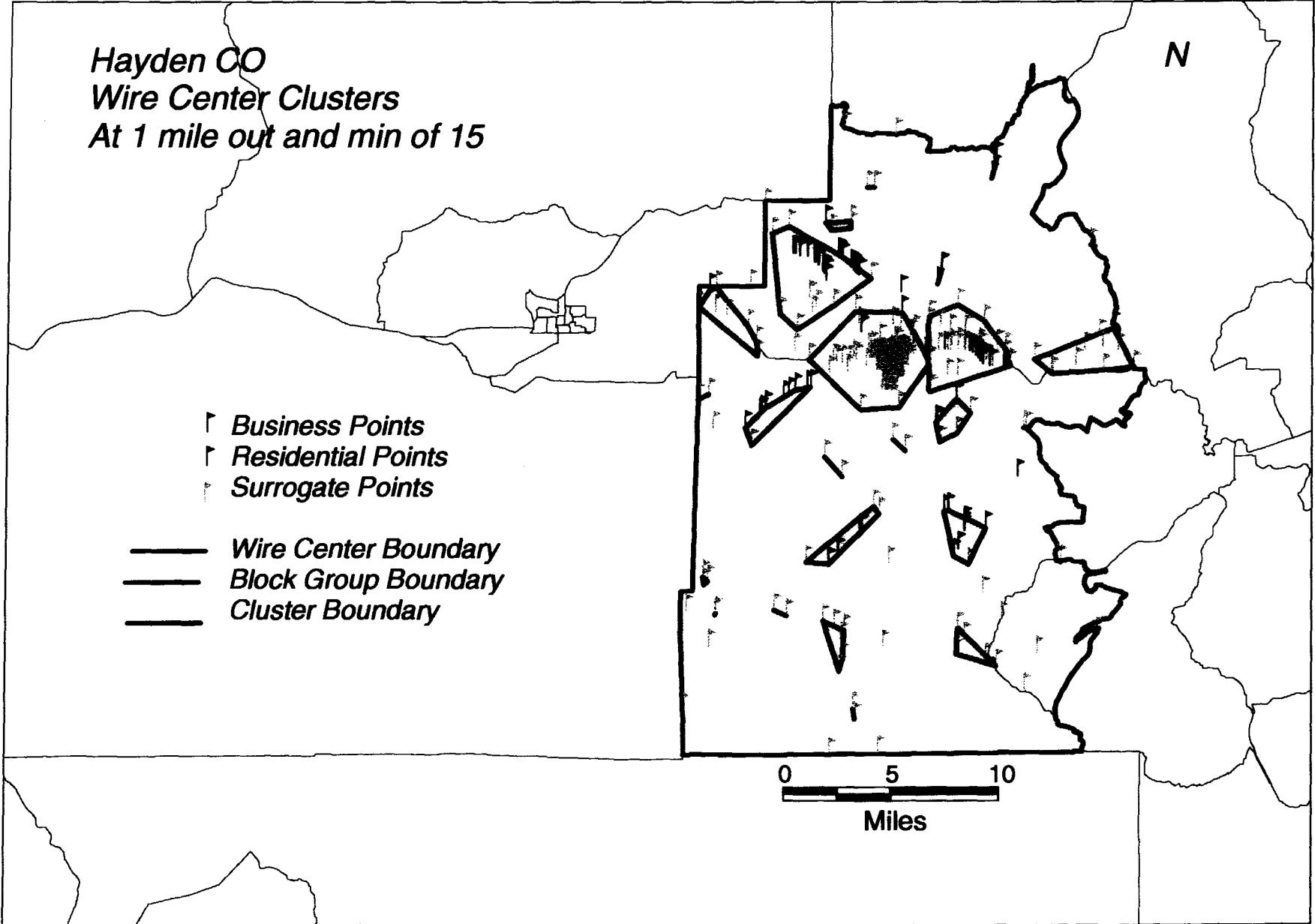


Hayden CO
Wire Center Clusters
At 1 mile out and min of 15

- ▷ Business Points
 - ▷ Residential Points
 - ▷ Surrogate Points
- Wire Center Boundary
— Block Group Boundary
— Cluster Boundary



0 5 10 Miles

Miles

A Summary of the Preliminary Hatfield Model 5.0 Distribution and Feeder Modules (Demonstration Versions)

Introduction

The following discussion summarizes the overall operation of the demonstration versions of the Distribution and Feeder Modules used to illustrate the application of the Hatfield customer location and population clustering process.

Distribution module

Distribution Module input data include individual records for clusters and "outliers;" each outlier "homes" on the nearest cluster, outlier records may contain several subscriber locations, and several outliers may home on a given cluster. Outliers are assumed by the model to be arrayed in a linear fashion along roads, with only one side of the road being populated.

The Distribution Module operates on input records as follows:

- clusters: The module constructs backbone and branch cable within the total area of the cluster; the SAI(s) (and remote terminal(s), if applicable) are located in center of cluster; the subfeeder cable extends to this point.
- outliers: The model constructs copper cable from the SAI or RT in the center of the cluster to the end of the outlier distribution; the outlier distribution is a linear array of subscriber locations presumed to be along one side of a road; the outlier area is uniformly divided among all customer locations, which are assumed square; the outlier "centroid" is assumed to lie in the center of the linear array, so that the array extends both toward and away from the cluster center from the nominal outlier location.
- use of fiber: The model constructs fiber feeder in several cases: 1) when the total feeder distance exceeds the user-adjustable fiber threshold (default = 9,000 ft); 2) when the total distance, including feeder, backbone, and branch, exceeds 18,000 ft; or 3) when the total distance, including feeder and road cable, exceeds 18,000 ft.

The HM5.0 (preliminary) demonstration distribution module does not contain the algorithms for selecting structure type (buried and aerial) according to surface and rock conditions and lifecycle costs nor does it include the calculations for selecting copper or fiber feeder according to lifecycle costs. These calculations will be included in the final version of the model. In a very few clusters, the sum of the branch and backbone cable distances may exceed 18,000 ft. The final version of the Distribution Module will subdivide such clusters to insure copper distances never exceed 18,000 ft.

Feeder module

The HM5.0 demonstration feeder module is essentially the same as that used in HM4.0. The demonstration version differs from the HM4.0 feeder module only in that the connecting cable calculations have been removed. The final version will contain the adaptive structure type calculations discussed above.

Description of Results

Outputs are provided for all six wire centers using clustering algorithm parameters that cause a cluster to be created when the number of lines in a geography are greater than or equal to 15 and all locations within the cluster are less than 2 miles from the nearest other point in the cluster. This is a relatively stringent hurdle to the creation of clusters, and causes less feeder to be engineered, but more distribution as distribution cables are what are used to link non-cluster locations to a “home” cluster. Excel workbook pages (one for each wire center) provide these results – which are entitled, “Hatfield 5.0a.”

Because of the stringency of the 2 mile, 15 line requirement, the Hatfield Sponsors have also provided, for the Hayden and Gunnison, Colorado wire centers, three additional runs using less stringent cluster creation requirements. These include a requirement that cluster locations have to be within 1 mile of their nearest neighbor within the cluster, with at least 15 lines in the cluster. The second is a requirement that cluster locations have to be within 2 miles of their nearest neighbor within the cluster, with at least 5 lines in the cluster. The third is a requirement that cluster locations have to be within 1 mile of their nearest neighbor within the cluster, with at least 5 lines in the cluster. As can be seen, the 2 mile, 5 line requirement appears to result in the engineering of a distribution and feeder network that is lower in investment cost, than the other combinations displayed. The Hatfield Sponsors are continuing to investigate whether the economies that appear to exist in serving clusters created under the 2 mile / 5 line requirement are generally the largest available – or whether other clustering parameterizations permit even more efficient engineering of subscriber loops.

Gunnison

Gunnison, Colorado
GNSNCOMA

2 mi. 15 pt.

	(a) Hatfield 4.0 Results	(b) Hatfield 5.0a Results	((b)/(a))-1
Total Lines	6,088	7,878	29.41%
Bus Lines	1,367	1,641	20.03%
Res Lines	3,463	5,171	49.31%
Specials	1,222	1,467	20.03%
Pub Lines	35	42	20.03%
Households	3,245	4,497	38.56%
area, sq. mi.	2,065	291	-85.91%
number of clusters	36	106	194.44%
number of DLC lines	1,823	3,728	104.55%
number of GR-303 terminals		2	#DIV/0!
number of low-density DLC terminals	22	20	-9.09%
main feeder distance (ft)	356,033	1,370,786	285.02%
subfeeder distance (ft)	241,385	613,154	154.01%
total feeder distance (ft)	597,418	1,983,940	232.09%
total distribution distance (ft)	1,247,225	6,702,791	437.42%
total loop distance (ft)	1,844,644	8,686,731	370.92%
maximum loop length (ft)	307,744	311,515	1.23%
road cable pairs	249	934	275.10%
pairs on T-1	54	195	261.11%
<i>Investment \$</i>			
copper feeder underground cable	\$ 107,074	\$ 158,849	48.35%
copper feeder buried cable	\$ 77,824	\$ 9,718	-87.51%
copper feeder serial cable	\$ 1,433,575	\$ 18,688	-98.70%
total copper feeder cable	\$ 1,618,473	\$ -	-100.00%
fiber feeder underground cable	\$ 204,796	\$ 162,351	-20.73%
fiber feeder buried cable	\$ 2,511,474	\$ 2,076,450	-17.32%
fiber feeder aerial cable	\$ 1,433,575	\$ 1,136,455	-20.73%
total fiber feeder cable	\$ 4,149,846	\$ 3,375,256	-18.67%
feeder conduit	\$ 90,639	\$ 74,117	-18.23%
feeder manholes	\$ 86,672	\$ 88,099	1.65%
copper feeder underground placement	\$ 155,791	\$ 176,736	13.44%
fiber feeder underground placement	\$ 572,528	\$ 660,430	15.35%
copper feeder buried placement	\$ 12,423	\$ 2,697	-78.29%
fiber feeder buried placement	\$ 1,144,649	\$ 1,288,561	12.57%
feeder pole investment	\$ 652,697	\$ 742,374	13.74%
total feeder structure	\$ 2,715,399	\$ 3,033,014	11.70%
total feeder investment	\$ 8,483,718	\$ 6,408,270	-24.46%
distribution underground cable	\$ 5,163	\$ 25,476	393.45%
distribution buried cable	\$ 1,580,242	\$ 6,189,919	291.71%
distribution serial cable	\$ 584,885	\$ 2,230,220	281.31%
total distribution cable	\$ 2,170,290	\$ 8,445,615	289.15%
distribution conduit	\$ 2,248	\$ 6,538	190.85%
distribution underground placement	\$ 67,307	\$ 290,649	331.82%
distribution buried placement	\$ 1,760,026	\$ 9,812,777	457.54%
distribution poles	\$ 494,035	\$ 2,903,539	487.72%
total distribution structure	\$ 2,323,617	\$ 13,013,503	460.05%
total distribution investment	\$ 4,493,907	\$ 21,459,118	377.52%
DLC investment	\$ 1,236,807	\$ 2,206,413	78.40%
SAI investment	\$ 40,400	\$ 46,100	14.11%
Terminal investment	\$ 307,352	\$ 495,962	61.37%
drop investment	\$ 189,422	\$ 221,594	30.79%
NID investment	\$ 132,786	\$ 178,404	34.35%
Total Loop Investment	\$ 14,864,390	\$ 31,015,861	108.66%
Investment per Line	\$ 2,441.63	\$ 3,937.0	61.24%

Hayden, Colorado
HYDNCOMA

2 mi. 15 pt.

	(a) Hatfield 4.0 Results	(b) Hatfield 5.0a Results	((b)/(a))-1
Total Lines	946	1,024	8.21%
Bus Lines	59	53	-9.80%
Res Lines	832	921	10.67%
Specials	53	48	-9.80%
Pub Lines	2	1	-9.80%
Households	781	801	2.63%
area, sq. mi.	959	95	-90.09%
number of clusters	12	27	125.00%
number of DLC lines	654	894	36.55%
number of GR-303 terminals		1	#DIV/0!
number of low-density DLC terminals	8	4	-50.00%
main feeder distance (ft)	77,440	115,579	49.25%
subfeeder distance (ft)	11,201	59,788	433.80%
total feeder distance (ft)	88,641	175,367	97.84%
total distribution distance (ft)	581,947	1,450,779	149.30%
total loop distance (ft)	670,588	1,626,146	142.50%
maximum loop length (ft)	182,349	161,739	-11.30%
road cable pairs	57	344	503.88%
pairs on T-1	18	89	393.85%
<i>Investment \$</i>			
copper feeder underground cable	\$ 2,294	\$ -	-100.00%
copper feeder buried cable	\$ 795	\$ -	-100.00%
copper feeder aerial cable	\$ 765	\$ -	-100.00%
total copper feeder cable	\$ 3,854	\$ -	-100.00%
fiber feeder underground cable	\$ 79,801	\$ 25,241	-68.37%
fiber feeder buried cable	\$ 968,172	\$ 234,649	-75.76%
fiber feeder aerial cable	\$ 558,607	\$ 129,182	-76.87%
total fiber feeder cable	\$ 1,606,579	\$ 389,072	-75.78%
feeder conduit	\$ 32,934	\$ 12,630	-61.65%
feeder manholes	\$ 7,976	\$ 2,631	-67.01%
copper feeder underground placement	\$ 6,260	\$ -	-100.00%
fiber feeder underground placement	\$ 175,033	\$ 135,436	-22.62%
copper feeder buried placement	\$ 429	\$ -	-100.00%
fiber feeder buried placement	\$ 361,400	\$ 134,411	-62.81%
feeder pole investment	\$ 203,079	\$ 80,898	-60.16%
total feeder structure	\$ 787,111	\$ 366,007	-53.50%
total feeder investment	\$ 2,397,544	\$ 755,078	-68.51%
distribution underground cable	\$ -	\$ -	#DIV/0!
distribution buried cable	\$ 655,501	\$ 1,502,306	129.18%
distribution aerial cable	\$ 212,617	\$ 514,020	141.78%
total distribution cable	\$ 868,118	\$ 2,016,326	132.26%
distribution conduit	\$ -	\$ -	#DIV/0!
distribution underground placement	\$ -	\$ -	#DIV/0!
distribution buried placement	\$ 658,474	\$ 2,129,596	223.41%
distribution poles	\$ 205,772	\$ 674,706	227.89%
total distribution structure	\$ 864,246	\$ 2,804,302	224.48%
total distribution investment	\$ 1,732,364	\$ 4,820,626	178.27%
DLC investment	\$ 560,545	\$ 620,482	10.69%
SAI investment	\$ 8,800	\$ 6,450	-26.70%
Terminal investment	\$ 63,664	\$ 54,656	-14.15%
drop investment	\$ 37,851	\$ 24,108	-36.31%
NID investment	\$ 24,480	\$ 25,188	2.89%
Total Loop Investment	\$ 4,825,248	\$ 6,306,590	30.70%
Investment per Line	\$ 5,100.69	\$ 6,160.52	20.78%

Duluth

Duluth, Georgia
DLTHGAHS

2 mi. 15 pt.

	(a) Hatfield 4.0 Results	(b) Hatfield 5.0a Results	((b)/(a))-1
Total Lines	34,182	43,471	27.17%
Bus Lines	10,633	16,124	51.64%
Res Lines	19,119	21,584	12.89%
Specials	4,299	6,520	51.64%
Pub Lines	130	198	51.64%
Households	17,358	18,768	8.13%
area, sq. mi.	41	38	-7.62%
number of clusters	76	14	-81.58%
number of DLC lines	20,853	43,471	108.46%
number of GR-303 terminals	17	33	94.12%
number of low-density DLC terminals	7	-	-100.00%
main feeder distance (ft)	233,586	227,850	-2.46%
subfeeder distance (ft)	88,826	120,612	35.79%
total feeder distance (ft)	322,412	348,463	8.08%
total distribution distance (ft)	1,393,587	1,383,060	-0.76%
total loop distance (ft)	1,715,999	1,731,522	0.90%
maximum loop length (ft)	38,413	53,370	38.94%
road cable pairs	297	-	-100.00%
pairs on T-1	-	-	#DIV/0!
Investment \$			
copper feeder underground cable	\$ 577,871	\$ -	-100.00%
copper feeder buried cable	\$ 200,329	\$ -	-100.00%
copper feeder aerial cable	\$ 192,624	\$ -	-100.00%
<i>total copper feeder cable</i>	<i>\$ 970,823</i>	<i>\$ -</i>	<i>-100.00%</i>
fiber feeder underground cable	\$ 161,894	\$ 135,379	-16.38%
fiber feeder buried cable	\$ 210,415	\$ 333,918	58.69%
fiber feeder aerial cable	\$ 124,361	\$ 182,622	46.85%
<i>total fiber feeder cable</i>	<i>\$ 496,669</i>	<i>\$ 651,919</i>	<i>31.26%</i>
feeder conduit	\$ 97,086	\$ 53,697	-44.69%
feeder manholes	\$ 153,843	\$ 9,862	-93.59%
copper feeder underground placement	\$ 140,133	\$ -	-100.00%
fiber feeder underground placement	\$ 867,834	\$ 598,413	-31.05%
copper feeder buried placement	\$ 10,094	\$ -	-100.00%
fiber feeder buried placement	\$ 132,739	\$ 199,348	50.18%
feeder pole investment	\$ 117,177	\$ 135,108	15.30%
<i>total feeder structure</i>	<i>\$ 1,518,904</i>	<i>\$ 996,427</i>	<i>-34.40%</i>
<i>total feeder investment</i>	<i>\$ 2,986,397</i>	<i>\$ 1,648,346</i>	<i>-44.80%</i>
distribution underground cable	\$ 33,753	\$ 38,877	15.18%
distribution buried cable	\$ 4,352,304	\$ 7,148,797	64.25%
distribution aerial cable	\$ 1,789,085	\$ 2,933,106	63.94%
<i>total distribution cable</i>	<i>\$ 6,175,142</i>	<i>\$ 10,120,780</i>	<i>63.90%</i>
distribution conduit	\$ 8,223	\$ 4,452	-45.86%
distribution underground placement	\$ 91,357	\$ 69,324	-24.12%
distribution buried placement	\$ 2,869,056	\$ 2,697,938	-5.96%
distribution poles	\$ 933,704	\$ 922,404	-1.21%
<i>total distribution structure</i>	<i>\$ 3,902,340</i>	<i>\$ 3,694,118</i>	<i>-5.34%</i>
<i>total distribution investment</i>	<i>\$ 10,077,482</i>	<i>\$ 13,814,898</i>	<i>37.09%</i>
DLC investment	\$ 3,438,520	\$ 6,714,300	95.27%
SAI investment	\$ 154,850	\$ 179,700	16.05%
Terminal investment	\$ 1,363,091	\$ 1,841,124	35.07%
drop investment	\$ 507,153	\$ 581,390	14.64%
NID investment	\$ 725,207	\$ 881,261	21.52%
Total Loop Investment	\$ 19,252,699	\$ 25,661,019	33.29%
Investment per Line	\$ 563.24	\$ 590.31	4.81%

Waynesboro

Waynesboro, Georgia
WYBOGAES

2 mi. 15 pt.

	(a) Hatfield 4.0 Results	(b) Hatfield 5.0a Results	((b)/(a))-1
Total Lines	7,261	9,121	25.61%
Bus Lines	1,411	1,399	-0.83%
Res Lines	5,263	7,960	51.24%
Specials	570	566	-0.83%
Pub Lines	17	17	-0.83%
Households	4,777	6,922	44.88%
area, sq. mi.	565	495	-12.32%
number of clusters	48	40	-16.67%
number of DLC lines	5,313	9,101	71.31%
number of GR-303 terminals	-	3	#DIV/0!
number of low-density DLC terminals	48	41	-14.58%
main feeder distance (ft)	291,262	1,472,794	405.66%
subfeeder distance (ft)	144,055	580,330	302.85%
total feeder distance (ft)	435,316	2,053,123	371.64%
total distribution distance (ft)	1,613,280	2,932,296	81.76%
total loop distance (ft)	2,048,597	4,985,419	143.36%
maximum loop length (ft)	155,007	126,254	-18.55%
road cable pairs	260	57	-78.06%
pairs on T-1	29	9	-67.31%
<i>Investment \$</i>			
copper feeder underground cable	\$ 71,360	\$ -	-100.00%
copper feeder buried cable	\$ 24,738	\$ -	-100.00%
copper feeder aerial cable	\$ 23,787	\$ -	-100.00%
total copper feeder cable	\$ 119,885	\$ -	-100.00%
fiber feeder underground cable	\$ 158,796	\$ 134,195	-15.49%
fiber feeder buried cable	\$ 1,946,811	\$ 1,712,356	-12.04%
fiber feeder aerial cable	\$ 1,111,573	\$ 939,368	-15.49%
total fiber feeder cable	\$ 3,217,180	\$ 2,785,920	-13.40%
feeder conduit	\$ 71,796	\$ 51,005	-28.96%
feeder manholes	\$ 69,117	\$ 10,626	-84.63%
copper feeder underground placement	\$ 75,976	\$ -	-100.00%
fiber feeder underground placement	\$ 384,340	\$ 437,241	13.76%
copper feeder buried placement	\$ 5,472	\$ -	-100.00%
fiber feeder buried placement	\$ 742,172	\$ 902,791	21.64%
feeder pole investment	\$ 426,174	\$ 540,432	26.81%
total feeder structure	\$ 1,775,048	\$ 1,942,095	9.41%
total feeder investment	\$ 5,112,114	\$ 4,728,015	-7.51%
distribution underground cable	\$ -	\$ -	#DIV/0!
distribution buried cable	\$ 1,994,245	\$ 5,132,690	157.38%
distribution aerial cable	\$ 653,822	\$ 1,645,093	151.61%
total distribution cable	\$ 2,648,067	\$ 6,777,784	155.95%
distribution conduit	\$ -	\$ -	#DIV/0!
distribution underground placement	\$ -	\$ -	#DIV/0!
distribution buried placement	\$ 1,873,373	\$ 3,892,623	107.79%
distribution poles	\$ 584,396	\$ 1,247,664	113.50%
total distribution structure	\$ 2,457,769	\$ 5,140,287	109.14%
total distribution investment	\$ 5,105,835	\$ 11,918,071	133.42%
DLC investment	\$ 3,460,807	\$ 2,184,100	-36.89%
SAI investment	\$ 57,100	\$ 61,800	8.23%
Terminal investment	\$ 500,369	\$ 792,846	56.45%
drop investment	\$ 273,151	\$ 391,772	43.43%
NID investment	\$ 168,984	\$ 233,140	37.97%
Total Loop Investment	\$ 14,678,361	\$ 20,309,744	38.37%
Investment per Line	\$ 2,021	\$ 2,227	10.16%

Albany

Albany, Texas
ALBYTXPO

2mi. 15pt.

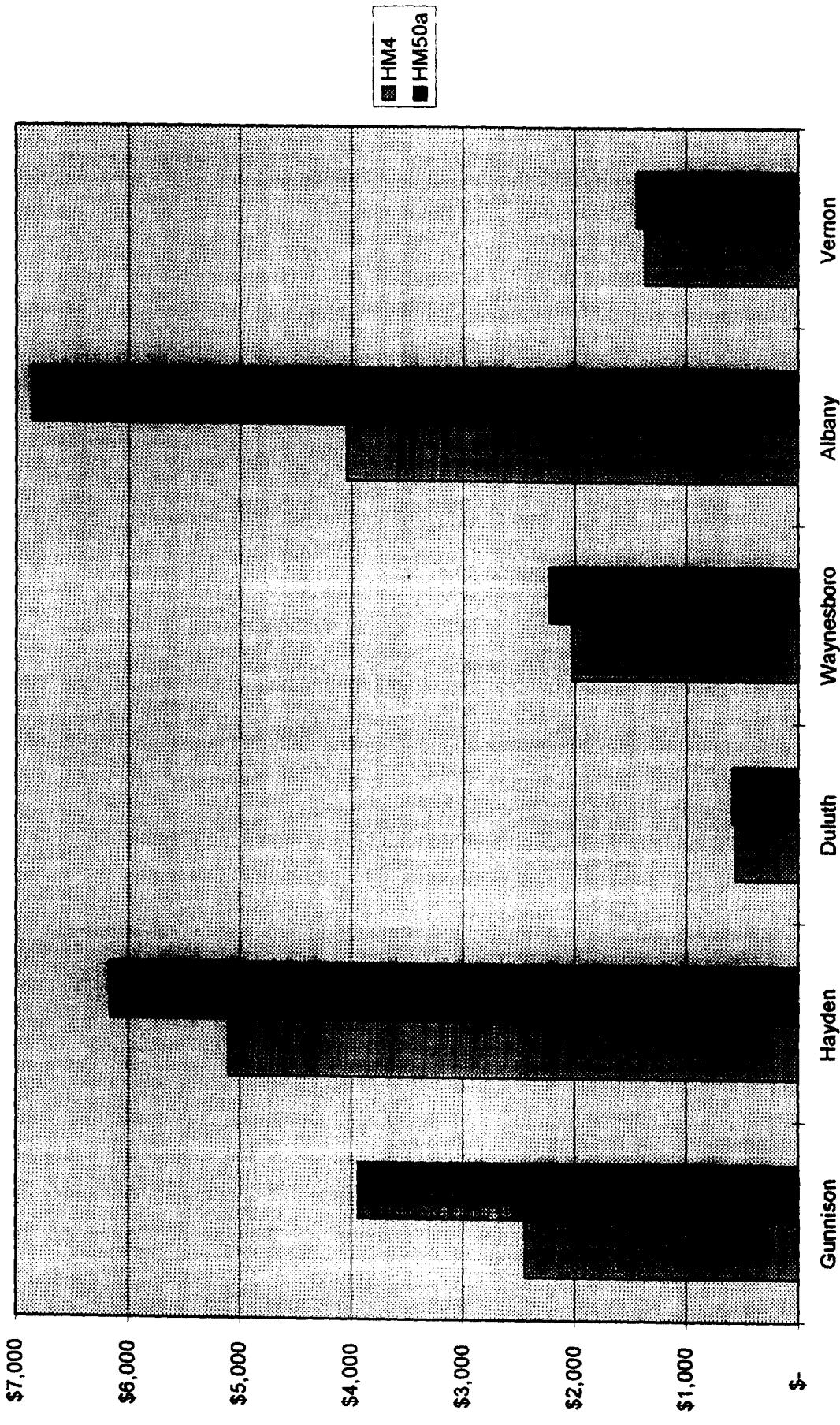
	(a) Hatfield 4.0 Results	(b) Hatfield 5.0a Results	((b)/(a))-1
Total Lines	833	1,631	95.87%
Bus Lines	9	235	2612.50%
Res Lines	819	1,264	54.35%
Specials	5	123	2612.50%
Pub Lines	0	8	2612.50%
Households	730	1,099	50.71%
area, sq. mi.	789	70	-91.19%
number of clusters	10	41	310.00%
number of DLC lines	244	1,530	526.62%
number of GR-303 terminals		1	#DIV/0!
number of low-density DLC terminals	4	3	-25.00%
main feeder distance (ft)	51,372	94,807	84.55%
subfeeder distance (ft)	8,266	53,044	541.74%
total feeder distance (ft)	59,637	147,850	147.92%
total distribution distance (ft)	490,372	3,376,871	588.63%
total loop distance (ft)	550,010	3,524,721	540.85%
maximum loop length (ft)	213,982	208,165	-2.72%
road cable pairs	84	349	316.00%
pairs on T-1	7	67	850.50%
<i>Investment \$</i>			
copper feeder underground cable	\$ 3,882	\$ -	-100.00%
copper feeder buried cable	\$ 36,340	\$ -	-100.00%
copper feeder aerial cable	\$ 38,825	\$ -	-100.00%
total copper feeder cable	\$ 79,047	\$ -	-100.00%
fiber feeder underground cable	\$ 49,974	\$ 19,303	-61.37%
fiber feeder buried cable	\$ 604,735	\$ 247,611	-59.05%
fiber feeder aerial cable	\$ 349,815	\$ 135,121	-61.37%
total fiber feeder cable	\$ 1,004,523	\$ 402,034	-59.98%
feeder conduit	\$ 21,165	\$ 7,987	-62.26%
feeder manholes	\$ 6,555	\$ 1,664	-74.61%
copper feeder underground placement	\$ 5,534	\$ -	-100.00%
fiber feeder underground placement	\$ 99,759	\$ 68,472	-31.36%
copper feeder buried placement	\$ 8,580	\$ -	-100.00%
fiber feeder buried placement	\$ 205,402	\$ 141,378	-31.17%
feeder pole investment	\$ 128,019	\$ 82,566	-35.50%
total feeder structure	\$ 475,015	\$ 302,067	-36.41%
total feeder investment	\$ 1,558,585	\$ 704,102	-54.82%
distribution underground cable	\$ -	\$ -	#DIV/0!
distribution buried cable	\$ 542,299	\$ 2,873,244	429.83%
distribution serial cable	\$ 173,814	\$ 920,911	429.83%
total distribution cable	\$ 716,113	\$ 3,794,155	429.83%
distribution conduit	\$ -	\$ -	#DIV/0!
distribution underground placement	\$ -	\$ -	#DIV/0!
distribution buried placement	\$ 531,620	\$ 4,101,689	671.55%
distribution poles	\$ 170,348	\$ 1,310,631	669.39%
total distribution structure	\$ 701,967	\$ 5,412,320	671.02%
total distribution investment	\$ 1,418,080	\$ 9,206,475	549.22%
DLC Investment	\$ 270,959	\$ 776,351	186.52%
SAI investment	\$ 6,700	\$ 9,250	38.06%
Terminal investment	\$ 53,833	\$ 127,113	136.13%
drop investment	\$ 36,875	\$ 72,239	95.90%
NID investment	\$ 21,713	\$ 37,780	74.00%
Total Loop Investment	\$ 3,366,745	\$ 10,933,310	224.74%
Investment per Line	\$ 4,043.32	\$ 6,859.48	69.65%

Vernon, Texas
VERNTXLI

2 mi. 15 pt.

	(a) Hatfield 4.0 Results	(b) Hatfield 5.0a Results	((b)/(a))-1
Total Lines	8,431	9,620	14.10%
Bus Lines	1,678	2,192	30.64%
Res Lines	5,818	7,184	23.49%
Specials	876	1,144	30.64%
Pub Lines	60	79	30.64%
Households	5,145	6,247	21.42%
area, sq. mi.	594	176	-70.34%
number of clusters	58	25	-56.90%
number of DLC lines	4,097	8,840	115.77%
number of GR-303 terminals	3	7	133.33%
number of low-density DLC terminals	14	8	-42.86%
main feeder distance (ft)	285,232	356,222	24.89%
subfeeder distance (ft)	165,797	158,716	-4.27%
total feeder distance (ft)	451,029	514,938	14.17%
total distribution distance (ft)	1,239,015	1,770,038	42.86%
total loop distance (ft)	1,690,044	2,284,976	35.20%
maximum loop length (ft)	206,700	133,554	-35.39%
road cable pairs	295	169	-42.76%
pairs on T-1	16	35	116.01%
<i>Investment \$</i>			
copper feeder underground cable	\$ 171,602	\$ 1,496	-99.13%
copper feeder buried cable	\$ 83,232	\$ 14,001	-83.18%
copper feeder aerial cable	\$ 82,665	\$ 14,958	-81.90%
<i>total copper feeder cable</i>	<i>\$ 337,499</i>	<i>\$ 30,455</i>	<i>-90.98%</i>
fiber feeder underground cable	\$ 124,558	\$ 58,653	-52.91%
fiber feeder buried cable	\$ 1,226,834	\$ 577,336	-52.94%
fiber feeder aerial cable	\$ 669,564	\$ 315,741	-52.84%
<i>total fiber feeder cable</i>	<i>\$ 2,020,956</i>	<i>\$ 951,729</i>	<i>-52.91%</i>
feeder conduit	\$ 88,458	\$ 25,437	-71.24%
feeder manholes	\$ 153,278	\$ 6,142	-95.99%
copper feeder underground placement	\$ 180,093	\$ 840	-99.53%
fiber feeder underground placement	\$ 416,307	\$ 247,685	-40.50%
copper feeder buried placement	\$ 16,301	\$ 1,300	-92.02%
fiber feeder buried placement	\$ 539,551	\$ 329,934	-38.85%
feeder pole investment	\$ 331,250	\$ 206,904	-37.54%
<i>total feeder structure</i>	<i>\$ 1,725,238</i>	<i>\$ 818,241</i>	<i>-52.57%</i>
<i>total feeder investment</i>	<i>\$ 4,083,693</i>	<i>\$ 1,800,426</i>	<i>-55.91%</i>
distribution underground cable	\$ -	\$ -	#DIV/0!
distribution buried cable	\$ 2,306,239	\$ 3,883,931	68.41%
distribution aerial cable	\$ 784,606	\$ 1,381,775	76.11%
<i>total distribution cable</i>	<i>\$ 3,090,845</i>	<i>\$ 5,265,707</i>	<i>70.36%</i>
distribution conduit	\$ -	\$ -	#DIV/0!
distribution underground placement	\$ -	\$ -	#DIV/0!
distribution buried placement	\$ 1,724,079	\$ 2,944,032	70.76%
distribution poles	\$ 550,920	\$ 940,597	70.73%
<i>total distribution structure</i>	<i>\$ 2,275,000</i>	<i>\$ 3,884,629</i>	<i>70.75%</i>
<i>total distribution investment</i>	<i>\$ 5,365,844</i>	<i>\$ 9,150,335</i>	<i>70.53%</i>
DLC investment	\$ 1,226,776	\$ 1,813,310	47.81%
SAI investment	\$ 55,000	\$ 48,600	-11.64%
Terminal investment	\$ 402,207	\$ 561,177	39.52%
drop investment	\$ 209,864	\$ 243,511	16.03%
NID investment	\$ 190,282	\$ 235,067	23.54%
Total Loop Investment	\$ 11,533,666	\$ 13,852,425	20.10%
Investment per Line	\$ 1,368	\$ 1,440	5.26%

Investment per Line - HM4.0 vs HM5.0a



Gunnison

Gunnison, Colorado
GNSNCOMA

	(a) Hatfield 4.0 Results	(c) 2 mi. 15 pt.	(d) 1 mi. 15 pt.	(e) 2 mi. 5 pt.	(f) 1 mi. 5 pt.
Total Lines	6,088	7,878	7,878	7,878	7,878
Bus Lines	1,367	1,641	1,641	1,641	1,641
Res Lines	3,463	5,171	5,171	5,171	5,171
Specials	1,222	1,467	1,467	1,467	1,467
Pub Lines	35	42	42	42	42
Households	3,245	4,497	4,497	4,497	4,497
area, sq. mi.	2,065	291	136	298	136
number of clusters	36	106	194	107	194
number of DLC lines	1,823	3,728	3,523	3,931	3,766
number of GR-303 terminals		2	2	2	2
number of low-density DLC terminals	22	20	14	40	33
main feeder distance (ft)	356,033	1,370,786	774,231	3,472,758	2,543,460
subfeeder distance (ft)	241,365	613,154	323,509	1,244,228	1,018,986
total feeder distance (ft)	597,418	1,983,940	1,097,740	4,716,987	3,562,446
total distribution distance (ft)	1,247,225	6,702,791	16,724,438	4,209,585	7,178,459
total loop distance (ft)	1,844,644	8,686,731	17,822,178	8,926,572	10,740,805
maximum loop length (ft)	307,744	311,515	302,238	293,148	365,463
road cable pairs	249	934	1,686	473	1,061
pairs on T-1	54	195	324	85	171
<i>Investment \$</i>					
copper feeder underground cable	\$ 107,074	\$ 158,849	\$ 158,849	\$ 149,684	\$ 149,684
copper feeder buried cable	\$ 77,824	\$ 9,718	\$ 9,718	\$ 9,157	\$ 9,157
copper feeder aerial cable	\$ 1,433,575	\$ 18,688	\$ 18,688	\$ 17,610	\$ 17,610
total copper feeder cable	\$ 1,618,473	\$ -	\$ 187,255	\$ 176,451	\$ 176,451
fiber feeder underground cable	\$ 204,796	\$ 162,351	\$ 89,842	\$ 288,953	\$ 246,892
fiber feeder buried cable	\$ 2,511,474	\$ 2,076,450	\$ 1,149,619	\$ 3,886,500	\$ 3,153,634
fiber feeder aerial cable	\$ 1,433,575	\$ 1,136,455	\$ 628,892	\$ 2,022,671	\$ 1,728,244
total fiber feeder cable	\$ 4,149,846	\$ 3,375,256	\$ 1,868,353	\$ 5,998,124	\$ 5,128,770
feeder conduit	\$ 90,639	\$ 74,117	\$ 45,756	\$ 119,528	\$ 105,461
feeder manholes	\$ 86,672	\$ 88,099	\$ 82,190	\$ 97,559	\$ 94,629
copper feeder underground placement	\$ 155,791	\$ 176,736	\$ 177,093	\$ 176,534	\$ 176,518
fiber feeder underground placement	\$ 572,528	\$ 660,430	\$ 380,316	\$ 1,057,787	\$ 916,815
copper feeder buried placement	\$ 12,423	\$ 2,697	\$ 2,702	\$ 2,694	\$ 2,694
fiber feeder buried placement	\$ 1,144,649	\$ 1,288,561	\$ 710,930	\$ 2,106,587	\$ 1,817,482
feeder pole investment	\$ 652,697	\$ 742,374	\$ 431,933	\$ 1,206,083	\$ 1,045,343
total feeder structure	\$ 2,715,399	\$ 3,033,014	\$ 1,830,920	\$ 4,768,772	\$ 4,158,942
total feeder investment	\$ 8,483,718	\$ 6,408,270	\$ 3,886,528	\$ 10,943,348	\$ 9,464,163
distribution underground cable	\$ 5,163	\$ 25,476	\$ 25,476	\$ 25,475	\$ 25,475
distribution buried cable	\$ 1,580,242	\$ 6,189,919	\$ 12,126,801	\$ 4,196,310	\$ 5,740,298
distribution aerial cable	\$ 584,885	\$ 2,230,220	\$ 4,133,066	\$ 1,591,225	\$ 2,086,093
total distribution cable	\$ 2,170,290	\$ 8,445,615	\$ 16,285,344	\$ 5,813,010	\$ 7,851,866
distribution conduit	\$ 2,248	\$ 6,538	\$ 6,538	\$ 6,538	\$ 6,538
distribution underground placement	\$ 67,307	\$ 290,649	\$ 290,649	\$ 290,630	\$ 290,630
distribution buried placement	\$ 1,760,026	\$ 9,812,777	\$ 23,783,105	\$ 6,399,130	\$ 10,521,902
distribution poles	\$ 494,035	\$ 2,903,539	\$ 7,251,203	\$ 1,847,858	\$ 3,174,287
total distribution structure	\$ 2,323,617	\$ 13,013,503	\$ 31,331,496	\$ 8,544,156	\$ 13,993,357
total distribution investment	\$ 4,493,907	\$ 21,459,118	\$ 47,616,839	\$ 14,357,166	\$ 21,845,223
DLC investment	\$ 1,238,807	\$ 2,206,413	\$ 3,452,325	\$ 2,117,280	\$ 2,825,130
SAI investment	\$ 40,400	\$ 46,100	\$ 43,100	\$ 51,000	\$ 48,150
Terminal investment	\$ 307,352	\$ 495,962	\$ 497,928	\$ 498,641	\$ 498,383
drop investment	\$ 169,422	\$ 221,594	\$ 222,670	\$ 221,901	\$ 222,847
NID investment	\$ 132,786	\$ 178,404	\$ 179,039	\$ 178,477	\$ 179,039
Total Loop Investment	\$ 14,864,390	\$ 31,015,861	\$ 55,898,429	\$ 28,365,814	\$ 35,082,935
Investment per Line	\$ 2,441.63	\$ 3,936.97	\$ 7,095.41	\$ 3,600.58	\$ 4,453.28

Hayden, Colorado
HYDNCOMA

	(a) Hatfield 4.0 Results	(f) 2 mi. 15 pt.	(g) 1 mi. 15 pt.	(h) 2 mi. 5 pt.	(i) 1 mi. 5 pt.
Total Lines	946	1,024	1,024	1,024	1,024
Bus Lines	59	53	53	53	53
Res Lines	832	921	921	921	921
Specials	53	48	48	48	48
Pub Lines	2	1	1	1	1
Households	781	801	801	801	801
area, sq. mi.	959	95	52	92	52
number of clusters	12	27	48	26	48
number of DLC lines	654	894	863	991	952
number of GR-303 terminals	-	1	1	1	1
number of low-density DLC terminals	8	4	3	12	11
main feeder distance (ft)	77,440	115,579	83,156	489,962	427,443
subfeeder distance (ft)	11,201	59,788	50,809	197,757	173,841
total feeder distance (ft)	88,641	175,367	133,965	687,720	601,284
total distribution distance (ft)	581,947	1,450,779	2,597,491	794,041	1,249,382
total loop distance (ft)	670,588	1,626,146	2,731,455	1,481,761	1,850,666
maximum loop length (ft)	182,349	161,739	161,726	134,808	140,922
road cable pairs	57	344	489	113	252
pairs on T-1	16	89	106	21	40
<i>Investment \$</i>					
copper feeder underground cable	\$ 2,294	\$ -	\$ -	\$ -	\$ -
copper feeder buried cable	\$ 795	\$ -	\$ -	\$ -	\$ -
copper feeder serial cable	\$ 765	\$ -	\$ -	\$ -	\$ -
<i>total copper feeder cable</i>	<i>\$ 3,854</i>	<i>\$ -</i>	<i>\$ -</i>	<i>\$ -</i>	<i>\$ -</i>
fiber feeder underground cable	\$ 79,801	\$ 25,241	\$ 24,044	\$ 58,558	\$ 58,558
fiber feeder buried cable	\$ 968,172	\$ 234,649	\$ 201,387	\$ 668,969	\$ 666,969
fiber feeder serial cable	\$ 558,607	\$ 129,182	\$ 111,195	\$ 365,708	\$ 365,708
<i>total fiber feeder cable</i>	<i>\$ 1,606,579</i>	<i>\$ 389,072</i>	<i>\$ 336,626</i>	<i>\$ 1,091,234</i>	<i>\$ 1,091,234</i>
feeder conduit	\$ 32,934	\$ 12,630	\$ 11,589	\$ 25,995	\$ 25,995
feeder manholes	\$ 7,976	\$ 2,631	\$ 2,414	\$ 5,416	\$ 5,416
copper feeder underground placement	\$ 6,260	\$ -	\$ -	\$ -	\$ -
fiber feeder underground placement	\$ 175,033	\$ 135,436	\$ 126,504	\$ 250,002	\$ 250,002
copper feeder buried placement	\$ 429	\$ -	\$ -	\$ -	\$ -
fiber feeder buried placement	\$ 361,400	\$ 134,411	\$ 115,968	\$ 370,959	\$ 370,959
feeder pole investment	\$ 203,079	\$ 80,898	\$ 69,639	\$ 221,427	\$ 221,427
<i>total feeder structure</i>	<i>\$ 787,111</i>	<i>\$ 366,007</i>	<i>\$ 326,114</i>	<i>\$ 873,798</i>	<i>\$ 873,798</i>
<i>total feeder investment</i>	<i>\$ 2,397,544</i>	<i>\$ 755,078</i>	<i>\$ 662,740</i>	<i>\$ 1,965,032</i>	<i>\$ 1,965,032</i>
distribution underground cable	\$ -	\$ -	\$ -	\$ -	\$ -
distribution buried cable	\$ 655,501	\$ 1,502,306	\$ 2,017,085	\$ 787,532	\$ 1,009,961
distribution serial cable	\$ 212,617	\$ 514,020	\$ 679,013	\$ 284,926	\$ 356,217
<i>total distribution cable</i>	<i>\$ 868,118</i>	<i>\$ 2,016,326</i>	<i>\$ 2,696,098</i>	<i>\$ 1,072,458</i>	<i>\$ 1,366,178</i>
distribution conduit	\$ -	\$ -	\$ -	\$ -	\$ -
distribution underground placement	\$ -	\$ -	\$ -	\$ -	\$ -
distribution buried placement	\$ 658,474	\$ 2,129,596	\$ 3,651,856	\$ 1,257,777	\$ 1,862,242
distribution poles	\$ 205,772	\$ 674,706	\$ 1,165,932	\$ 399,069	\$ 604,233
<i>total distribution structure</i>	<i>\$ 864,246</i>	<i>\$ 2,804,302</i>	<i>\$ 4,817,788</i>	<i>\$ 1,656,846</i>	<i>\$ 2,466,475</i>
<i>total distribution investment</i>	<i>\$ 1,732,364</i>	<i>\$ 4,820,628</i>	<i>\$ 7,513,886</i>	<i>\$ 2,729,304</i>	<i>\$ 3,832,653</i>
DLC investment	\$ 560,545	\$ 620,482	\$ 833,325	\$ 528,784	\$ 691,553
SAI investment	\$ 8,800	\$ 6,450	\$ 6,100	\$ 8,450	\$ 8,200
Terminal investment	\$ 63,664	\$ 54,656	\$ 54,656	\$ 54,656	\$ 54,656
drop investment	\$ 37,851	\$ 24,108	\$ 24,104	\$ 24,109	\$ 24,104
NID investment	\$ 24,480	\$ 25,188	\$ 25,188	\$ 25,188	\$ 25,188
Total Loop Investment	\$ 4,825,248	\$ 6,306,590	\$ 9,119,997	\$ 5,335,522	\$ 6,601,386
Investment per Line	\$ 5,100.69	\$ 6,160.52	\$ 8,908.77	\$ 5,211.95	\$ 6,448.49